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MISCELLANEOUS.

Rarefying Osteitis.

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Read before the Kansas Medical Society, May, 1895.

I desire to report a rare and interesting case, and to call attention to some of the conditions found in connection therewith. But before I proceed to the report, you will pardon me if I review some of the physiological and pathological conditions found in bone, as well as attempt to make myself clear in the title of this paper.

Rarefying osteitis is a condition occurring in bone whereby the osseous tissue is destroyed, or absorbed, and replaced by granulative tissue. Physiologically we find rarefying osteitis occurring in growing bone. After the beginning of ossification, new bone is deposited beneath the periosteum and coincidently absorption, or rarefaction, commences at the center. After a fracture, the Haversian canals at the seat of injury become enlarged from their walls being destroyed by this process, and the previously compact bone becomes spongy and filled with granulative tissue before ossification of the callous commences. It then, in this case, is part of the process of repair. Also a bone wherein the nutrition is arrested, or is necrosed, may be thus removed, if of limited extent and is not eliminated by other means. Tubercular and syphilitic as well as some other myotic conditions inducing a chronic inflammatory condition in osseous structures, are accompanied by a rarefying osteitis occurring as a secondary process immediately preceding or surrounding the inflammatory areas. Pressure on bone, as from tumors and aneurisms, leads to absorption of the osseous structures.

Rarefying osteitis is then a rarefaction by absorption of the matrix of the bone. This is accomplished under all conditions by large or small mono-nucleated or multi-nucleated cells called osteoclasts. Under all conditions of the bone, physiological or pathological, when bone is being destroyed, we find these cells present, normally in the little depressions, Howship's lacunæ on their outer surfaces. The manner in which these cells act is by eroding the matrix. The cell seems to fasten itself to the matrix and the latter slowly disappears in front of it, the cell then sinking deeper into the matrix. Whether this is accomplished by a cellular ferment acting locally on the matrix or by a phagocytic action of the cell itself, I am unable to determine; but probably by both methods. By this action of the cells, the matrix soon assumes a notched border. That portion of the matrix next to the osteoclast presents a hyaline appearance, suggesting that some chemical agent had acted on the firmer structures, and the notched outline suggesting a vital action of the cell itself.

The cells, or osteoclasts, are of various sizes and contain one or more nuclei. Our works on histology, both normal and morbid describe the predominating form of osteoclast as multi-nucleated. This I think is not always true, as I can demonstrate in sections of bone removed from the case which I will relate. In this the predominating form is a large mono-nucleated cell. But under normal conditions, where destruction is occurring more slowly and where nutrition is maintained at a different standard, then we do find the multi-nucleated or giant cell engaged in this process. If we accept

the views of some histologists in regard to formation of the giant cell, viz: the coalescence of the protoplasm of adjoining cells without destruction or union of their nuclei, then we are able to see why under conditions occurring normally, when nutrition differs in quantity and quality from pathological conditions, we may have such cells formed. I believe the first stage, in the life history of these giant cells, is the small cell, and that the continuation of the process of rarefaction once started depends upon the continued reproduction of the small cell; for it is not known that giant cells are capable of reproducing giant cells. True, the individual smaller cell is not capable of disposing of as much osseous tissue as its larger sister.

Succeeding the process of rarefaction and following closely in its wake, we have new formed tissue of denser or looser structure, which in normal conditions becomes the marrow, and in pathological conditions is a form of granulative tissue. Later, if placed under favorable conditions of nutrition, ossification instead of rarefaction may be established. Ossification may commence from the proliferation of osteoclasts from the present osseous tissue forming next to the granulative tissue with the succeeding deposit of osseous lamella; or we may have ossification succeeding to the formation of fibrous tissue and cartilage. Both of which conditions may be seen after fracture at some stage in the process of repair, and the latter of which I can demonstrate in connection with this case.

Why we have these cells, osteoclasts, devouring by their action cells and firm tissues, as we have in bone, I am unable to express a definite opinion. It is my belief that through some agency with which we are not always familiar, the nutrition of the firmer elements is altered and therefore their physiological resistance is diminished, and that inherent attribute which all physiological tissues possess whereby neighboring tissues lie side by side without invading the other, is destroyed, and the stronger, well nourished, embryonal connective tissue cells take the place of the more poorly nourished. The osteoclasts, I believe, do not exist in the physiological condition as cells whose only function is the destruction of bone. Neither do I believe that these cells are always the progeny of pre-existing osteoclasts; but I do believe that any cell capable of phagocytic action may become an osteoclast. Fixed tissue cells and leucocytes in other locations where absorption is occurring in an area of tissue, may become phagocytes. If so, why not in bone? It can be demonstrated in bone undergoing absorption that the leucocytes may be engaged as osteoclasts. If this be true, then I will say that the osteoclasts are derived from connective tissue sources, and only exist when nature demands the removal of improperly nourished bone.

The causes which lead to a rarefying osteitis as a pathological process, are not well understood. Rarefying osteitis may and does occur after traumatism, as a secondary condition to the infective granulomata involving bone, and, rarely, as a primary condition from socalled idiopathic causes.

Having thus called attention to some of the points in the general pathology of rarefying osteitis, I wish to relate the following case and present specimens and drawings in order to illustrate it:

N. H—, male, age 18, gave following history: As a child to the age of six years was as other children; at this time he passed through a severe attack of diphtheria to be followed by a septic sequela. After this time he complained of pains of an aching character in both tibiæ and in the right radius, not constantly, but at longer or shorter periods, and the tibiæ became inflamed but not ulcerated. He continued to grow very rapidly and no thought was taken of the pains in the legs, they being ascribed to "growing pains." At the age of 14 it was noticed that the tibia of either leg was curved anteriorly, enlarged, roughened or nodular, and deformed. He became tired very easily, and was not able to stand exercise as other boys on account of the aching pains. Slight traumatisms such as other boys received and never noticed, would cause

him excruciating pain. When he had passed his seventeenth birthday the skin over the tibiæ became inflamed and ulcerated, and he commenced to loose flesh. Thinking a change of climate would benefit him, he went to Colorado. He did not improve, but on the contrary lost strength and flesh.

In April, 1893, he was brought to Topeka, where, in consultation with Dr. Ward, he was examined. The examination showed a boy 18 years of age, average height; weight about 105 pounds; emaciated and very weak. He gave no history of socalled hereditary disease—the family, as I have determined, is a healthy one. His temperature was 101°, pulse 120. Examination of chest, except a protrusion of his sternum as well as other organs, negative. Examination of tibiæ showed enlargement and deformity, with ulcerations on anterior surface of left tibia and inflammation of skin over the right. By probing the ulcers on left tibia necrosed bone could be felt, and ulcerated channels could be detected leading deep into the bone. Osteitis was diagnosed, and operation advised and accepted.

April 25 operation was performed by Drs. Ward, Rodgers, and myself. At this operation it was found that the periosteum of the left tibia was much thickened and numerous channels led into the depths of the bone. The bone after much difficulty was sawed and chiseled away until it was thought that all diseased bone had been removed. The bone removed was very hard and no marrow cavity could be found. The area of diseased and removed bone extended from the tubercle of the tibia to near the ankle joint. The operation having been prolonged and the patient in a very weak condition, it was thought best to wait a few days before attempting to do anything for the right leg. He was then put on supportive treatment, and five days later, April 27, a similar operation was undertaken for the removal of the diseased bone in the right tibia. This bone, though not exhibiting such pronounced external symptoms as the left, was in a much worse condition. The bone showed the same condition as the left and it was also sawed and chiseled away. The wounds made by operation were allowed to heal by granulation on account of the septic condition existing.

On May 16, it having been determined that a small area the size of a ten-cent piece was not granulating, a small operation was undertaken for its removal. From this time the wounds did nicely, and by the middle of July were entirely healed. The patient was apparently entirely well. After the operation his pulse dropped to normal and his temperature faded away. He improved rapidly and in July weighed 130 pounds, a gain of 25 pounds. He considered himself well, and although cautioned against violent exercise, he seemed to have forgotten this, and while engaged in playing ball he injured his right leg. Inflammation ensued followed by ulceration.

October 10 he again consulted us, and by probing diseased bone could be felt in the lower third of the right tibia. His pulse and temperature was elevated Again the diseased bone was apparently removed. The wound healed, but soon broke out afresh, and the patient was emaciated and weak.

December 4 amputation was performed at juncture of middle with upper third. This did not seem to remove all of the diseased bone, and although the amount at the end of the stump, about the size of a cherry, was curetted away, this did not check the process, and a second amputation, January 27, 1894, was made above the knee.

At this time there has been no return of the trouble in this limb.

On May 11, 1894, a small ulcer having formed in the upper third of left tibia, a slight operation under cocaine was done, and a small bit of diseased bone was drilled away.

At this time, one year after his last operation, we find him strong and well, weighing 130 pounds, wearing an artificial limb; doing the work of a station agent, riding a bicycle, and enjoying life as only one can who has been relieved of a great load of suffering.

Nothing was promised this boy but amputation and possible loss of life. Yet it was determined to save all that was possible.

The operations for chiseling away the diseased bone was against our judgment, but we thought we would not be justified in amputating until other means had been tried and had failed. We recognized that a poor natural leg was better than no leg at all, and we resolved to save all we could.

I will now present three specimens and call attention to some of the pathological conditions found:

Specimen No. 1.—Blocks of dryed bone removed from left tibia. Notice the roughened, eburnated external surface; the porous, spongy internus; also the channels leading into the bone—the areas of absorption.

Specimen No. 2.—Stump after first amputation. Notice the process of rarefaction extending from the end of the tibial stem upward toward the knee. This is soft and filled with granulative tissue. This, also, shows the point where the cherry-sized area was curetted away at the time of first amputation. Notice the absence of marrow cavity.

Microscopical sections of the bone at each of these operations shows the same pathological condition present in each.

The periosteum was thickened as a result of a periostitis. The channels were discharging pus. No bacteriological examination was made of the granulative tissue, but sections of hardened tissue do not show bacteria in the deeper structures. I am of the opinion that the periostitis was a secondary inflammation caused by pus-forming bacteria gaining entrance to the channels opening through the skin.

I believe this case of rarefying osteitis is a primary process having its origin in the severe septic attack of diphtheria. It is well known that the toxines of diphtheria acting on tissues will alter the biological character of the cells, and especially of connective and vascular structures. I believe the attack of diphtheria led to nutritive changes in these tibiæ, and that rarefaction succeeded it. If you will examine specimen No. 1 you notice the hard eburnated character of the firm bone. I think periods of rarefaction and ossification—condensing osteitis or osteosclerosis—succeeded each other according as to the supply of nutrition, and that finally nutrition could not be furnished in sufficient amount to supply the large amount of osseous structure formed. Nutrition to the osseous structure was probably arrested, partly from the osteosclerosis on the outer surfaces, and interference with the blood supply from the medulla; this leading eventually to the absorption of these poorly nourished structures.

The process of absorption begins around the Haversian canals; these are enlarged and filled with granulative tissue. The blood-vessels are also enlarged and embryonal in character.

From the Haversian canal the process extends until the entire Haversian system is absorbed. By this absorption of adjoining systems a coalescence of the areas of granulative tissue will take place, and a cavity filled with embryonal tissue will be the result. In the embryonal tissues bits of unabsorbed bone may be found.

In none of the sections made could there be found cystic cavities of any description. In none of these sections involving the destructive process could there be found any other tissue than embryonal, thus differing from a physiological absorption.

I have detailed all of the prominent points in connection with the clinical and pathological conditions found in this case. I have tried to make plain some of the intricate points in the histology. Now I wish to say a few words in a general way.

While this case comes under the nomenclature of the socalled idiopathic diseases, yet I think it should be traced to diphtheria; and I believe that at some future date the word idiopathic will be stricken from the list, not only of this condition, but of others. The term rarefying osteitis in connection with this case I think is a misnomer. It implies an inflammation, which in physiological conditions does not exist, and in this case only occurred after infection with pus microbes. The better term would be osteo-rarefaction.

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Society Discussions.

The particular tone of the discussion of the papers read before the various societies depends a great deal upon the character of the members and their individual relations. The benefits to be derived from these meetings, however, depends in great measure upon the discussion. Fearless and honest criticism, if made in a gentlemanly manner neither harms the author of a paper nor shocks the audience. There is too much of a tendency to compliment every paper whether it be really meritorious or only fit for the waste basket. If the members of a society would understand that every paper presented should be critically dissected and as much effort displayed to find its weak points as well as its strong ones, authors would be stimulated to do better work, and those taking part in the discussion would be better prepared. We have heard papers that would have disgraced a first-year student read before a society composed of intelligent and successful practitioners and receive the compliments of each in succession. Was it because of their respect for the author? If so, how badly they were mistaken. The only time consideration in such a case would suggest an honest criticism and, if possible, impress the author of such a paper that if he would take the time of the society he must bring something that in itself would evidence work and study. Unless a paper be really meritorious compliments do credit neither to the author of the paper nor the author of the compliment. Mutual admiration is all right in its place, but it should have no place in a medical society. If a man knows more than his fellows on any subject there is no better place for him to prove it than in a medical society, but he should be prepared and competent to prove his assertions.

Most any man who has had a fair education and has had a few years' experience can write a good paper if he will devote the proper amount of time and study to it. The great trouble with too many papers is that they have been written in haste, the points poorly presented, and many things stated as facts which a few hours' investigation would render very doubtful. There is only one way to correct this evil, and that is by inaugurating a system of discussion which will bring out every point in the paper whether weak or strong.

It is not essential that one have a new discovery in order that he may write an interesting paper. Old facts are often as interesting as new ones if they be properly presented and logical deductions be made. We do not all follow the same course of reasoning, and oftentimes a review of the oldest theories of medicine suggests new ideas.

THE Womans Medical College of Kansas City has been organized and will be ready for business the coming season.

Antiseptics in Surgery.

Antiseptics in surgery have a very limited field, and one which is constantly narrowing. In aseptic cases, where no infection was present, and was not introduced by the surgeon, it was easily seen that antiseptics were superfluous. These agents were therefore reserved for those cases where septic processes were already at work, for emergency cases where it was thought impossible to secure perfect asepsis, or lastly, they were used by those surgeons who must admit, to themselves at least, that they could not do their work in a perfectly aseptic manner, and who must use an antiseptic to destroy the septic matters which they themselves have introduced.

Are there any such among the readers of the JOURNAL? If there be one let him now pack a bag with everything needed to prepare a room, patient and the operators for the performance of a surgical operation in an aseptic manner. Let him also prepare a room at his office and furnish it with everything required to enable him to conduct surgical operations at a short notice and perfectly aseptic in all details.

If this be done there will be no need for antiseptics. In the practice of the best surgeons they have been abandoned for years, not even in pus cavities are they used, but great care is taken to evacuate the cavity and to provide for the free escape of the pus. Pus is not even washed out, for in so doing the pus is diluted and rendered more easily absorbed. J. C. M.

Nucleins.

Wm. H. Porter, M.D., in American Medico-Surgical Bulletin.

Ever since the application of bacteriology to scientific medicine, the biologists, the physiological chemists, and even the manufacturing chemists have tried to produce something out of the animal kingdom by which disease can be prevented and cured. In the list of substances produced we find immunizing serums, animal extracts, toxins, antitoxins, nucleins, etc. The antitoxin, so called, of diphtheria, and the nucleins are among the later productions, and are now begging for a position among reliable therapeutic agents.

All of the host that have gone before are far from being established upon a satisfactory basis, either chemical, physiological, or clinical. The best that can be said of any of them is that, in experimental work, a few instances of more or less complete immunization in the lower animals have been noted. As yet, however, nothing definite has been accomplished in their application to man, and some, like tuberculin, have been complete and deadly failures. Among the animal extracts an exception may be made in favor of the extract of the thyroid gland, which appears to have a decided influence in modifying the clinical symptoms of myxedema. But even here it is not curative; it simply stops the progress of the disease, and permits of a partial recovery. So long as the patient continues to take the extract the symptoms are held in abeyance; withhold the extract, and all the symptoms at once return. How long these favorable results can be maintained is still awaiting final settlement. It should be remembered, however, in connection with these favorable results, that the exhibition of the thyroid extract often produces grave constitutional disturbances and cannot always be tolerated with safety.

Of the toxins and antitoxins none of them has yet reached an indisputable position among the so-called antitoxin of diphtheria —which, however, is an absolutely unknown quantity as yet—made it appear that a grand discovery had been made, and one which would fully demonstrate the power of serum therapy. But as one closely scrutinizes both sides of this important question, and gets honestly at all the factors that enter into this involved problem, the evidence in favor of the value of antitoxin grows less and less certain, and one cannot but fear that it will ultimately prove a failure, as many of its predecessors have done. What, then, is the true position of the nucleins?

First of all it may be well to try and ascertain what nuclein is, and from whence it comes. Most of the substances already mentioned have been absolutely unknown quantities. Nuclein, however, appears to be a little more tangible substance, and one which has in a measure been formulated. It is described as a tetra-basic acid, composed of carbon, hydrogen, nitrogen, phosphorus, and oxygen, with the formula $C^{29}H^{49}N^{9}P^{3}O^{22}$.

The antecedent chemical substance, from which nuclein appears to be derived, is a complex molecule, apparently the product of synthetic process in plant life by which a few atoms of phosphorus and iron are made to enter into combination with the proteid molecule. This more complex molecule has received the name nucleoalbumen. From this anabolic origin in the vegetable kingdom this compound gains access, as do proteids, to the animal tissues, and here it appears to be deposited by preference of Nature in the protoplasm or nuclei of the cells. It is also found in the secretions, and is then spoken of as destroyed or altered protoplasm. In some instances this may be true, but in other instances, as when it appears in milk and in the yolk of eggs, it can hardly be spoken of justly as destroyed protoplasm, for this is the only source of phosphorus and iron during the period of life, when milk is the only form of food supplied to the animal economy. It may be altered, it may exist in another isomeric form, but there is a wide difference between destroyed and isomerically altered protoplasm.

Nucleo-albumin, therefore, must be looked upon as a common constituent of all cell-elements. It is a substance which when isolated behaves like a strong acid; it is almost insoluble in water, but dissolves readily in the presence of a little alkali. The nucleo-albumin in many respects resembles the globulins, but differs from them in that it contains phosphorus. It is quite probable that the original nucleo-albumin is a vegetable globlin, to which phosphorus and iron atoms have been added, as a little iron is always found in this substance.

Viewed in this light, nucleo-albumin is a synthetic product of vegetable chemistry where anabolic construction is continually taking place. When this nucleo-albumin is oxidized, or split up, it yields as one of its katabolic oxidation products a substance which is far more simple in its atomic structure than the nucleo-albumin from which it came. To this more simple molecule $C^{29}H^{49}N^{9}P^{3}O^{22}$, the name "nuclein" has been given. Nuclein was first made from pus, then from spermatozoa, blood corpuscles, hens' eggs, the yeast plant, from liver cells, from cows' milk, etc. In fact, whatever nuclei are present a substance can be obtained from their contained nucleo-albumin, which, in a measure, is rich in in phosphorus, soluble in weak alkalies, insoluble in acids and in artificial gastric juice, and which has a sticky character somewhat like mucin, but differing from the latter in containing phosphorus.

From this method of development it appears quite clear that the opinion held by many observers that nuclein is not a normal constituent of the animal economy is the correct one. Nuclein, on the other hand, is a katabolic product obtained from the oxidation or splitting up of the complex molecule known as nucleo-albumin, in the same manner that urea and uric acid are katabolic products resulting from the oxidation or splitting up of the proteid molecule.

Nuclein has never been found in the excretions as one of the katabolic bodies of the nitrogenous composition for the normal elimination of nitrogen and phosphorus from the body. In fact there is no evidence to show that such a compound is ever formed in the system, but simply that it can be made from the nucleo-albumin, which is a common constituent of all cell-protoplasm. Nuclein, therefore, must be classed as a purely artificial product of the analytical chemist's laboratory.

That the contained phosphorus of the nucleo-albumin is the source of the phosphorus compound, lecithin, is probably true. The phosphorus of these substances is the source of the phosphoric acid, owing to which the phosphates eliminated from the system are always in excess of the phosphates taken into the animal economy in the food-stuffs,

This much has been established, but just where these oxidation changes take place is yet to be determined. The remaining nitrogen of the nucleo-albumin, after yielding up its phosphorus, appears to leave the body in the form of the higher oxidation products, such as urea, uric acid, etc.

As there is no tangible evidence at hand that animal life or animal chemistry can take simple molecules and build them up into more complex molecules, it cannot be argued logically that nuclein, if administered to the animal economy, can be converted into a nucleo-albumin, thus enhancing the nutritive chemical activity and life of the protoplasmic elements.

We are left, then, for a solution of the therapeutic value of the nuclein, if it has any to one of two methods of explanation; methods by which all chemical compounds must be examined if they have not the common properties of the food-stuffs.

First. It may simply be a foreign body which acts by its irritating and poisonous properties, thus stimulating normal and inactive protoplasm to increased activity, without in itself undergoing any chemical change, as occurs with all the inorganic compounds. Or, second, it must be a substance which, from its organic nature, is capable of being rapidly oxidized, thus yielding heat and exciting active chemical mutations of a greater intensity and higher kinetic energy than occurs when the normal food-stuffs are introduced.

If it can be shown that nuclein stimulates the animal economy, either in normal or abnormal states, by either of the above methods, into a more rapid chemico-physiological activity, so that the system can more rapidly utilize the normal food-stuffs and develop a higher nutritive state, and thus place the system in a higher state of resistance against toxic agents of all kinds, then nuclein can be classed as a valuable therapeutic agent. It must also be shown to accomplish this more successfully than the well-tried and known alkaloids and glucosides before it can be set in advance of these tried agents in our therapeutic list. It must also be shown that, when nuclein is used, there is a rapid change in the excreta, so that abnormal katabolic products are replaced by those of a normal composition, both as regards quantity and quality.

All this must be accomplished before nuclein can be considered even as a valuable and reliable therapeutic agent, to say nothing of its displacing the old and well-tried remedies. When we look for this kind of evidence it is not to be found. All that can be discovered is the bold claim that the nuclein enters into the cell and gives to it, as it were, new life and new power to destroy microbic and toxic agents.

It matters not what the therapeutic agent is; in every instance it must be demonstrated conclusively when applied practically at the bedside:

First. That it enhances the power of the enfeebled system to utilize the normal food-stuffs to greater advantage than otherwise would occur.

Second. That it increases the chemico-nutritive activity of the system, and thus increases the power of the animal economy to resist more effectually the intrusion of all abnormal conditions.

Third. There must be a marked change in the amount and number of the abnormal katabolic bodies eliminated in the excreta, and a marked tendency to change from the abnormal to the normal excretory products which indicate a normal state of the system.

Fourth. There must be an absolute decrease in mortality.

These are the conditions that must be met wholly or in part before any remedial agent can be considered as a thoroughly reliable therapeutic remedy. Working with this practical standard constantly before him, the clinician finds to his sorrow that many things which appear to work most satisfactorily in the experimental laboratory are total failures when applied to sick and suffering humanity. Thus far nuclein appears to be another compound to be added to the long list of total failures.

We would not in any way wish to discredit experimental work; but greater care should be exercised in making deductions

from results obtained experimentally upon the lower animals, and in their application to the human economy in its various pathological states. Disaster and total failure have so repeatedly followed the adoption of random conclusions that now the clinician is naturally in constant doubt regarding any and all new discoveries.

When the biologist, the physiological chemist and the clinician have reached that harmonious stage which will make it possible to bring their observations more uniformly into relation with one another, then we shall see the day when more successes and fewer failures will be recorded in medicine.

The Infiltation Method of Local Anesthesia in Genito-Urinary Surgery.

Read before the American Association of Genito-Urinary Surgeons, at Niagara Falls, N. Y., May 28, 1895, by Brans ford Lewis, M.D., of St. Louis.

In July, 1894, at the German Congress of Surgeons (afterwards presented in the *Therapeudic Monatshefte*, No. 9, 1894), Dr. Schleich announced and detailed a new method of producing local anesthesia by the use of intra-cutaneous (rather than sub-cutaneous) injections of very dilute solutions of various drugs; and he indicated the distinctiveness of the method by terming it Infiltration Anesthesia. Later, in a monograph entitled "Schmerzlose Operation," Berlin, 1894, the author treated the subject more extensively, and gave the results of its use in some three thousand operations, minor and major.

During 1894, the method received some attention from the American medical press, and was put to practical test by American surgeons. Dr. H. V. Wurdeman, of Milwaukee, presented the subject in an admirable manner in the *Journal of the American Medical Association*, December 29, 1894.

The principle of the method consists in injecting intra-cutaneously certain solutions and dissipating the sensibility of the peripheral nerves by the pressure of the infiltrating fluid, by the anemia which it causes, and by the comparatively low temperature at which it is injected—three effects secured by the *fluid itself* rather than by any drug which it may contain. As a matter of fact, the drugs used are of only incidental importance.

It has long been known that the injection of fluids in some considerable quantity would cause a deadening of the part; but the induction of this insensibility has not been sufficiently controllable to place it within the limits of wide surgical practicability; and the initial pain to which it would give rise, was another objectionable feature which discounted its usefulness.

By thought and much experimentation these problems, as well as others, have been practically overcome by Dr. Schleich; so that for the kind of surgery to which the *injection* of anesthetizing fluids is applicable, whether "minor" or "major," the use of the older cocainizing method is liable to be entirely superseded by the infiltration method; and the position of chloroform and ether narcosis is already being assailed by those who have made practical use of it.

If a syringe-needle be inserted obliquely into the skin, the point reaching just below the epidermal layer, and a few drops of the proper fluid be injected there, an elevated wheal, looking like a mosquito-bite, will be the result; and tests with a needle or knife immediately afterwards will show the entire area of the wheal to be absolutely insensible, while the sensiblity of the skin just beyond the edematous area is not disturbed in the least.

Experimentation has shown that promptitude and practical efficacy of the anesthesia so induced depend on several factors: (1) The density of the the fluid used; (2) The character and strength of the drug or combination of drugs embodied in the solution; (3) The temperature of the latter; (4) The condition (of health or disease) of the tissues to be anesthetized; and, (5) The maintenance of complete edema of the tissue to be operated upon.

Density of the Fluid—It has been found that a physiologic salt solution, 0.6 per cent., would cause a wheal but not an anesthetic one; while a 0.2 per cent. salt solu-

tion produced sufficient anesthesia to allow of the removal without pain, of a nevus from the neck of the eminent Dr. Bergmann. Solutions of sugar, 3 per cent.; potassium bromide, 3 per cent; morphine, 0.1 per cent; carbolic acid, 0.5 per cent; and caffeine, 2 per cent; all show markedly anesthetic effects, while above and below these strengths become irritative and painful. This develops the second-named factor,

The Character and Strength of Drugs Used—While it is a fact that the various agents mentioned will produce anesthesia after a certain length of time, the first and primary effect of some of them is irritative, and they excite pain until their secondary, anesthetic effect begins to prevail. In order to obviate this difficulty, use is made, in the formula, of certain drugs (cocaine, morphine) which in proper strength have an immediate anesthetic effect, thus doing away with the transient irritative effect of the other, secondarily, anesthetic drugs in the combination. This is especially important when considered in connection with

The Condition (of Health or Disease) of the Structures to be Operated Upon—While the difference in the primary-irritative and the secondary-anesthetic effect may not be so sharply marked in normal, healthy tissues, as in the removal of a nevus, in the case of inflamed structures (crucial incisions into a carbuncle), it is markedly prominent; and unless it were prevented, it would defeat the purpose and advantages of the method. Happily, this is accomplished in either of several ways: By using such drugs in the combination (cocaine, etc.) as have an immediate anesthetic effect, even though diluted to the degree mentioned; by beginning the anesthesia in the healthy structures and continuing it by successive injections into the unhealthy ones; by producing a temporary spray-anesthesia of the inflamed structures, sufficient to allow of the introduction of the infiltrating fluid. Of these, the first will be found to be most commonly useful; and it is for that reason, chiefly, that cocaine is used at all. However, the point must be emphasized that though cocaine is used in this way, it is vastly different from the manner of using it hitherto in vogue; since, instead of using a strength of from two to ten or twenty per cent., the strength entirely capable, by this method, of producing the anesthesia desired is that of one or two *hundredths* per cent; and instead of a very few drops producing a toxic (perhaps a highly dangerous) effect, one or two or three *ounces* may be used without the slightest systematic symptom.

Temperature of the Injected Fluid—It has been observed that the same strength of solution, when used cold, is much more highly anesthetic than if it warm. For this reason, it is advised to keep the bottle of fluid on ice before and during the operation.

Complete Infiltration—Every tissue of the body, without exception (skin, muscles, glands, mucous membrane, nerves, etc.) becomes insensible to pain when infiltrated in the manner described. This obtains for bone and the hard structures, as well as the soft ones. Bone is reached either through infiltrating its periosteum or by injecting into the medulla. Nerve trunks are anesthetized separately, first by applying five per cent. carbolic acid solution, and then, through this, inserting the needle and fluid.

Only the infiltrated, artificially edematous tissue is anesthetic, the tissues just outside of which retain normal acuteness of sensibility. Consequently, in the course of an operation, with absorption of the infiltrated fluid, it is necessary to renew the injections or extend their area co-incidently with the operative field. After infiltration, the anesthetic condition lasts from fifteen to twenty minutes.

With the proper fluid, anesthesia ensues *immediately* on its being introduced into the tissues, and lapse of time is not requisite for developing insensibility. This, again, is in marked contrast to the effect of the older methods of producing anesthesia. Its advantage is great.

Hemorrhage—Anemia being one of the effects of the method, it may be supposed that there will be less bleeding (oozing) than under ordinary circumstances. This is the case. And distortion of the tissues from the infiltrated fluid does not cause any especially

increased difficulty in securing and tying or twisting bleeding vessels. Nevertheless, in operating in deeper structures, the use of the syringe-needle involves the risk of piercing blood vessels, nerves, etc., for which care must be observed.

Formulæ—In his various surgical procedures, Dr. Schleich finds the following three solutions of graded strengths to answer all swer all purposes:

STRONG SOLUTION, No. 1

℞

Cocain. muriat., ...gr. iii.
Morph. muriat., ...gr. i-3.
Natr. chlor., ...gr. iii.
Aq. dest., ...ad oz. iii.

M. Sterilisat., adde sol. acid. carbobic., 5 per gtt. iii.

MEDIUM-STRENGTH SOLUTION NO. 2.

℞

Cocain. muriat., ...gr. iss.
Morph. muriat., ...gr. i-3.
Nat. chlor., ...gr. iii.
Aq. dest. .....ad oz. iii.

M Sterilisat., adde sol. ac. carbolic. 5 per cent., gtt. iii.

WEAK SOLUTION NO. 3.

℞

Cocain. muriat., ...gr. i-6
Morph. muriat., ...gr. i-12
Natr. chlor., ...gr. iii.
Aq. dest., ...ad oz. iii.

M Sterilisat., adde sol. ac. carbolic. 5 per cent., gtt. iii.

SOLUTION No. 1, Dr. Schleich uses for operating on inflamed or hyperesthetic areas; No. 2, for most operations; No. 3, for superficial solutions on nearly normal tissues.

To carry out the aims of asepsis, he recommends that only steril solutions be used; and to this end, he advises that the reservoirs be sealed with scorched-cotton stoppers, and that from these smaller vessels should be filled at the time of operating.

I have made use of the infiltration method in operating on buboes (enucleation); in opening a prostatic abscess through the perineum; in circumcisions and some other minor procedures.

In working in superficial structures, its effect is all that one could wish and beyond criticism. While in the deeper parts of wounds such as met with in evacuating prostatic abscess, encleating buboes, etc., it is more difficult to secure complete and absolute anesthesia, on account of the care necessary to prevent the injury of deep-lying structures, still, with the increased skill obtained by practice, objections on this line are removed and local anesthesia is effected with proportionately increasing success. It appears to me that testicular ablation, for instance, could be done without a particle of suffering on the part of the patient.

The after-pain I have not found to be greater than with other modes of anesthesia; and the other disagreeable after-effects of general anesthesia are, of course, avoided. Two of my patients were over sixty years old, yet they felt as well after as before the operations. No symptom of intoxication has become evident in any case that I have observed, and I have not been sparing in the use of the fluid.

I have made use of a larger syringe and longer needle than that recommended by the author, and I think this facilitates matters considerably, obviating numerous successive punctures in order to fill up the tissues sufficiently. The infiltration may be begun with a small syringe and fine needle and continued, without pain, with the larger.

Electricity and Cats.

Medical Record.

Our lay contemporary, the New York *Press*, has apparently joined the ranks of those papers which seriously propose to bring home to the minds of plain people the more important discoveries of modern medicine. The propriety of thus encroaching upon the proper territory of medical journalism is open to grave question. The public is so apt to draw wrong conclusions from even the most simplified presentation of erudite propositions, that the danger-point may be reached before suspicion has fairly been wakened. The electrical properties of cats are knowingly referred to in the *Press*. Evi-

dently the writer was inspired by a profound respect for an article published recently in the *British Medical Journal*. The *Press* has this to say on the subject: In England the cat has just received her scientific vindication as a factor that makes for good in civilization. They have a National Cat Club in Great Britain, and at the recent annual meeting of this august body the secretary announced to an admiring audience of feline fanciers that cats, and more particularly old cats, were "intense." In family circles it has been known for some time that persons of recognized "intensity were occasionally called "old cats." But a suspicion of slight opprobrium has generally been associated with this use of the term. The purely scientific correlation of intensity and cats is undeniably English, and likely to remain so for the present.

The "intensity" of cats, even of ordinary old toms, can be demonstrated by gently rubbing their backs in cold dry weather, and, preferably, in the dark. It will then easily appear that the animal is "full of electricity." It is therefore proposed to employ old cats as convenient storage batteries for electrical accumulation. It has already been accurately computed that a really intense cat, when properly charged, will give off enough electric sparks to shatter three ordinary attacks of hysterics. People subject to this distressing form of nervous disorder can now be seen in London accompanied by their intense cats. A stock company (limited) has also been organized, and is now in a position to supply certified felines of unimpeachable pedigree and requisite intensity for all functions where hysterics are apt to go off unexpectedly. Emotional first-nighters, girls who habitually get engaged and disengaged, æsthetic tea frequenters, Paderewski worshipers, grass widows, office seekers, and all individuals whose nervous systems require occasional fortification, now never venture out in London without a duly tested intense cat within easy reach. For children's parties and charitable enterprises kittens have been found strong enough. It is further proposed to use the "living feline galvanism" for curative purposes in cases where formerly the more complex and expensive system of hypnotic suggestion was in vogue. The *British Medical Journal*, in commenting on these interesting and epoch-making researches, says: "Apart from questions of electro-physiology, it is instructive to learn that the presence of white in the color of a cat, unless the animal be whole colored, is a sign of weakness. It is also interesting to know that the National Cat Club encourages the production of whole-colored cats and would have been successful in this, had it not been for the disappointing obstinacy of the tortoise-shell "tom," who, it appears, resolutely declines to become a cat of another color." On the whole, the cat seems as full of promising utility as of intensity. We congratulate the British National Cat Club on the eminent success of their feline labors. We await with bated breath the advent of "intense" cats in our country. Perhaps there are some here now. Who knows!

The Cost of an Epidemic.

Maryland Medical Journal.

As an illustration of the pecuniary loss to the community arising through the prevalence of infectious diseases, Dr. Campbell Munro, medical officer of health of the county of Renfrew, in his annual report in the *British Medical Journal*, makes the following interesting statement: In the course of an epidemic of enteric fever in 1893 there occurred 859 cases, and 74 people lost their lives. He put aside any reference with respect to the immense amount of bodily pain and suffering, the mental distress and anguish, the misery and wretchedness involved in these figures. He confined himself to the pecuniary aspect of the question. Having before him an approximate statement of the wages earned by each individual wage earner attacked in the course of the epidemic, together with the average period during which he was prevented by illness from pursuing his occupation, he was in a position to estimate the cost of the epidemic to the community through loss of wages at

$16,455. There was next to be considered the expense involved in connection with the treatment of these illnesses, extending, on an average, over seven weeks. He found that the average cost of treatment for each patient received into hospital in the course of the epidemic was about $43.75. He was, therefore, well within the mark in estimating the average cost of treatment of cases, overhead, at $25. It might be taken that, in respect of a large proportion of the cases treated at home, the cost of treatment was limited by the pecuniary capacity of the household. The cost of treatment upon this scale amounted to $21,475. $24 was the accepted estimate of the average amount incurred in connection with funeral expenses; and the expenditure arising in this connection falls to be set down at $1850. Finally, they had to estimate the value to the community of the lives lost in the course of the epidemic. That human life had a distinct pecuniary value was a consideration which had probably never entered the mind of the average citizen. Nevertheless, the matter was one susceptible of actual demonstration. A quotation from the writings of Farr, the greatest authority on the subject, would best illustrate the position of the matter. "As lands, houses, railways, and other categories in the income tax schedules are of value, because they yield annual returns, so for the same reason and on the same principle, the income of the population derived from pay of every kind for professional or other services, and wages, can be capitalized; not precisely, it is true, unless the income of every person living were returned at least as nearly as incomes subject to income tax; but sufficiently near to the true value to show that the value of the population itself is the most important factor in the wealth of the country. . . The capitalization of personal incomes proceeds upon the determination of the present value, at any rate, of the future annual earnings at that and all future ages."

The value to the community of an individual member was ascertained by deducting the capitalized future cost of subsistence of the individual from his capitalized future income. Proceeding upon these lines Farr arrived at the conclusion that "the minimum value of the population of the United Kingdom—men, women and children—was $795 a head; that was the value inherent in them as a productive, money-earning race." He estimated the value of the United Kingdom at the time he was writing as equivalent to a capital sum of $26,250,000,000, while the "capital" of the country (using the term in its ordinary sense) amounted to Mr. Giffen's estimate to, $42,500,000,000.

Adopting Farr's figures as a basis for the calculation, he has made a rough estimate of the value "inherent in" the persons who died in the course of this epidemic, "as a productive, money earning race." He found that it amounted to the very large sum of $6[illegible],700. So that the pecuniary loss to the community of Mid-Renfrewshire, arising in connection with the epidemic, amounted to the enormous total of $107.480. A consideration of these figures, Dr. Munro observes, might well sugg st the reflection whether any investment was calculated to yield a better pecuniary return than the expenditure involved in the operations of the Public Health Department, which had for their main object the prevention of epidemics.

Guaiacol in the Treatment of Orchitis.

National Board of Health Magazine.

Balzer and Lacour have communicated to the Hospitals Medical Society of Paris the results of their treatment of orchitis with guaiacol (*Ann. de Derm et. Syph*). Their attention was directed to this agent on account of its sedative and antithermic action. Pure guaiacol applied in the quantity of one gram, morning and evening, causes a somewhat marked smarting sensation which, in about ten minutes, becomes a simple sense of heat lasting for a couple of hours; the pain is first relieved and then disappears completely, sleep becomes possible and the temperature falls to normal. Pure guaiacol often gives rise to erythema and desquamation of the scrotum; it is, therefore, advisable to use five or ten grams of the drug to

thirty grams of vaselin. With this mixture the smarting is hardly noticeable, but the sensation of heat is the same as with the pure drug; the therapeutic effects, while somewhat less prompt, are equally satisfactory, pain is rapidly lessened, temperature lowered and sleep made possible. The ointment as a rule does not irritate the scrotum. The inunctions are made with three to five grams of the mixture, repeated twice daily, the scrotum being covered by a compress held by a T-bandage.

Chekan, for Chronic Cough of Aged People.

D. W. C. Manley, in the *Chicago Medical Times*, writes as follows concerning the efficacy of chekan, or eugenia chequen, as a remedy in chronic catarrhal inflammation of the respiratory mucous lining:

"Dr. William Murrel, of London, highly recommends chekan in the winter coughs, and it is in these cases, especially in aged people, that I have given it the most thorough trial, and in chronic cases it has given the best satisfaction.

"It seems to be particularly adapted to those conditions following an acute inflammation of the air passages, which take on the character and symptoms, except the elevation of temperature, of phthisis pulmonalis in younger subjects. I usually prescribe the flluid extract in half-drachm doses, from four to eight times a day, in a little simple syrup or the fluid extract liquorice. It is especially beneficial in purulent bronchitis, and I have found it to act nicely in all chronic coughs, particularly when the bronchial passages *only* are involved. I would not use it in phthisis pulmonalis."

DR. HUTCHISON, who will fill the Chair of Chemistry in the Kansas Medical College, has come to the city. Dr. Hutchison is a pharmacist and a graduate in medicine and denistry, and he is also a thorough, enthusiastic chemist. We congratulate the College on such an acquisition.

Render the Intestinal Canal Antiseptic.

The Materia Medica gives at least one safe intestinal antiseptic. It is Salol. Professor Hare, in the last edition of his Practical Therapeutics, says that Salol "renders the intestinal canal antiseptic, and so removes the cause of the disorder, instead of locking the putrid material in the bowel, as does opium." He regards Salol as "one of the most valued drugs in the treatment of intestinal affections." Have we a substitute for opium for the relief of pain? Here comes in the American coal-tar products the first of which, for the relief of pain, stands Antikamnia. Therefore, we conclude that to remove the cause, to render the intestinal canal antiseptic, we have an invaluable remedy in Salol; while to remove accompanying pain, to quiet the nervous system, and to reduce any fever which may be present, we have a remedy equally efficacious in Antikamnia; *an ideal combination for the treatment of this large class of diseases, and we may specially cite Typhoid Fever.* These two drugs are put up in tablet form, called "Antikamnia and Salol Tablets," each tablet containing two and one-half grains of Antikamnia and two and one-half grains of Salol.

WE have made arrangements for an editorial department in Kansas City through which we expect to be able to furnish our readers with a number of excellent papers and news of the work being done there in the profession.

THE Topeka Academy of Medicine did not adjourn *sine die* at its last meeting as was proposed, but showed quite enough animation to carry it along to a good old age. A little stimulus and it has a brilliant future.

DR. J. M. FRANKENBURGER has been appointed first assistant in the Stormont Hospital, and is now sharing offices with Dr. Ward.